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NOTICE

As indicated in the "Introduction" to *Nuclear Science Abstracts*, Nos. 6B, 12B, 18B, and 24B normally consist of New Nuclear Data. Please note that New Nuclear Data, originally intended for separate issuance in No. 6B and No. 12B, will be combined and issued as New Nuclear Data, Volume 10, No. 12B, dated June 30, 1956.

BIOLOGY AND MEDICINE

3326 AEC-tr-2388

RESEARCHES ON THE MECHANISM OF THE ACTIONS OF THE HYDRAZIDES OF ISONICOTINIC ACID: THEIR RELATIONSHIP TO THE PYRUVIC ACID OF THE MICOBACTERIA. S. Garattini and A. Leonardi. Translated by Soliska R. Harris from Giorn. Ital. chemioterap. I, 281-8 (1954). 13p.

RADIATION EFFECTS

3327 ANL-5518

Argonne National Lab., Lemont, Ill.

REPORT ON BIOLOGICAL, MEDICAL, AND BIOPHYSICS PROGRAMS. PART I. SEMIANNUAL REPORT OF RADIOLOGICAL PHYSICS DIVISION. PART II. QUARTERLY REPORT OF BIOLOGICAL AND MEDICAL RESEARCH DIVISION. Jan. 1956. 224p. Contract W-31-109-eng-38. \$1.00(OTS).

Radiological Physics. Progress is reported on the following studies: the effect of gas pressure on the performance of ionization chambers; the efficiency of the twin scintillator method for measuring neutron fluxes to energies greater than 14 Mev; the effects of radiation on the optical and scintillation properties of various organic solvents, with and without added scintillator; Rn contamination in apparatus used for measurements of expired Rn from humans having natural body Ra; the use of butyl phosphates as extractants of Th from bone samples; the performance of scintillation counters in the detection of Rn; the bone deposition of Ca⁴⁵ following injection in dogs as determined from the specific activity of the blood as a function of time; the feasibility of adding heavy metal-organic compounds to liquid scintillators to increase absorption of γ rays; the performance of a halogen detector; application of the low-level γ -ray facility to the measurement of the radioactive burden of humans due to both natural and acquired radioactivity; and instrument design for studies on the effect of weather elements upon the rate of atmospheric diffusion and the capacity of the atmosphere to dispose of contaminants. Biological and Medical Research. Results are presented from a survey of parasites infesting laboratory mice and the effectiveness of various control measures; the effects of ultraviolet light on the mating reaction in paramecium; the effect of β -emitting isotopes upon survival and upon the incidence of malignant bone tumors following injection in mice; calculations of the total radiation dose from body deposits of Ra; decay constants for radioisotopes; effects of x irradiation on plasma constituents in chicks; ascorbic acid and nucleic acid metabolism in guinea pigs; identification of Escherichia Coli enzymes; protein synthesis in the pancreas and liver of rats and in yeast; biochemical patterns in health and in the presence of malignant tumors; the

morphology of connective tissue; radioinduced bacterial inactivation; the response of *Drosophila* to single and periodic x-ray exposure; the radiosensitivity of pigeons; radiation effects on nucleic acids in grasshopper eggs; factors affecting plant transport and radiodecomposition of C¹⁴-labeled sugars; neutron dosimetry; biological effects of neutrons; factors affecting enzyme activity and synthesis; effects of x radiation on amoeba; the protective effects against radiation injuries in mice of cells perfused from hypoxic spleens; the establishment of a frozen ascites tumor bank; and the liquid scintillation counting of tritium-labeled water. (For preceding period see ANL-5486.) (C.H.)

TOXICOLOGY STUDIES

3328 UCLA-361

California. Univ., Los Angeles. Atomic Energy Project.

HYPOTENSIVE AND OTHER PHARMACOLOGICAL PROPERTIES OF THREE QUATERNARY OXAZOLIUM COMPOUNDS: 2(1-NAPHTHYL)-, 2-(4-METHOXY-PHENYL)-, AND 2-(4-METHYLPHENYL)-3-METHYL-5-PHENYLOXAZOLIUM-4-TOLUENESULFONATE. Thomas J. Haley, W. G. McCormick, and A. M. Flesher. Mar. 22, 1956. 24p. Contract AT-04-1-GEN-12. \$4.80(ph OTS); \$2.70(mf OTS).

It was shown that three substituted oxazolium compounds produced a hypotension whose depth and duration was dose dependent. There was no significant effect on the respiration or the myocardium, and the electrocardiogram was not changed during the hypotension. Furthermore, the hypotension could not be modified by prior administration of atropine or an antihistaminic. The oxazolium compounds gave no evidence of adrenergic or ganglionic blocking properties. Their ability to block acetylcholine or histamine spasms of the isolated intestine was of a very low order. The hypothermic effects of these compounds have been confirmed. Furthermore, they produce a profound hypothermic effect when administered with Phenergan and Hydergine. The oxazolium compounds do not prevent chromoachryodynna in rats, but their vasodilator effect does prevent epinephrine death in mice. The oxazolium compounds have no effect on the eye, and they are analgetic only in doses which are toxic. (auth)

CHEMISTRY

3329 AECU-3179

Massachusetts Inst. of Tech., Cambridge. Lab. for Nuclear Science.

PROGRESS REPORT [NO. 39 FOR THE PERIOD SEPTEMBER 1, 1955 THROUGH NOVEMBER 30, 1955]. Nov. 30,

1955. 83p. Contracts AT(30-1)-905 and N5ori-07806. \$13.80(ph OTS); \$4.80(mf OTS).

Results indicate that the complex of AgBr in HCl is not weakly acidic as reported by other investigators. A spectrometric study was made of the bleaching of ferric thioglycolate. The electrodeposition behavior of trace amounts of Ni and Cu, automatic thermometric titrations, and electrochemical reaction rate were also studied. The solvent extraction of Te^{4+} , In^{3+} , and mineral acids by β , β' -dichloroethyl ether and solvent extraction of Au^{3+} were investigated. Studies were initiated on the adsorption of Te^{4+} on ion exchange resins. The exchange of chlorine atoms between HCl and HAuCl_4 in β , β' -dichloroethyl ether was found to be very fast (< 30 sec). Decay properties of Cs^{138} , Al^{26} , and Ag^{111} are reported. The nuclear properties and stabilities of Pd, Ag, and Cd isotopes (mass number 108 through 116) were investigated. Diphenyl, benzoic acid, and phenyl benzoate were among the products of thermal decomposition of benzoyl peroxide in cyclohexane. Operating data are presented for the high-pressure rectangular ionization chamber. The large air shower experiment is briefly described. K particle scattering and π^+ meson spin are discussed. The yield of the O^{16} (d, α) N^{14} reaction as a function of deuteron energy was studied. Energy levels in Ne^{20} , Na^{23} , A^{36} , and K^{39} were investigated. Studies were continued on inelastic proton scattering from Fe, angular distributions of scattered alpha particles, and neutron absorption and scattering. (For preceding period see AECU-3121.) (C.W.H.)

ANALYTICAL PROCEDURES

3330 ANL-5240

Argonne National Lab., Lemont, Ill.

SUMMARY REPORT ON THE DETERMINATION OF IMPURITY ELEMENTS IN AMES THORIUM BILLET A-520. J. P. Burelbach and R. J. March, comps. Sept. 1953. Decl. Oct. 20, 1955. 145p. Contract W-30-109-eng-38.

A representative billet of Ames thorium metal was analyzed for impurity elements by the nine laboratories participating in the thorium analytical program of 1952-53. Chemical and spectrographic results and procedures are presented, together with a summary of the program meeting of September 1952 and post-meeting comment. Also included is the result of a danger coefficient test in which the Ames metal was compared with iodide thorium in the CP-2 reactor of the Argonne National Laboratory. (auth)

3331 DP-72

Du Pont de Nemours (E.I.) & Co. Savannah River Lab., Augusta, Ga.

THE IODIMETRIC DETERMINATION OF HYDROGEN SULFIDE IN GAS SAMPLES. R. C. Milham. Mar. 1956. 10p. Contract AT(07-2)-1. \$0.15(OTS).

3332 KAPL-854

Knolls Atomic Power Lab., Schenectady, N. Y.

THE THERMAL ANALYSIS OF ZIRCONIUM-TIN ALLOYS. L. L. Wyman and J. F. Bradley. Dec. 23, 1952. Decl. Nov. 22, 1955. 19p. Contract W-31-109-Eng-52. \$0.15 (OTS).

Several alloys of zirconium containing $\frac{1}{2}$ to 5 wt. % tin have been studied by dilatometric and thermal analyses. Contrary to previous reports, it was found that when properly instrumented, the thermal effects could be de-

tected and that these effects generally confirm the previously proposed zirconium-tin diagram. Additional arrests at about 775 and 840°C indicate the need for further study to ascertain the causes of these reactions. (auth)

3333 NAA-SR-1443

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

QUANTITATIVE ANALYSIS OF THE TERPHENYLS BY A COMPRESSED PELLET INFRARED METHOD. Eugene L. Colichman, Raymond F. Fish, and George Bjarke. Mar. 15, 1956. 25p. Contract AT-11-1-GEN-8. \$4.80(ph OTS); \$2.70(mf OTS).

A quantitative compressed pellet infrared method has been developed and reported here for the analysis of ortho-, meta-, and para-terphenyl. Method has been applied to the determination of the terphenyl content of irradiation damaged samples. The feasibility of quantitative infrared analysis using conventional solution techniques is demonstrated. It is seen, however, that the compressed pellet method is considerably more useful for analysis of polyphenyl compounds due to the greater sensitivity of pellet spectra and the low solubility when conventional infrared solvents are employed. In the infrared region of most interest (~ 6.5 to 15μ), the greater intensity of the pellet bands permits quantitative estimations with only about 1 mg of polyphenyl material. A slight deviation from Beer-Lambert's law (attributed to background intensity change with concentration) is observed only in the case of ortho-terphenyl which does not interfere with the quantitative spectral method, as long as transmission is in the range, 10 to 70%. It is expected that the compressed pellet spectral method developed here might well find application in the analysis of compounds other than polyphenyls. (auth)

3334 ORNL-1476

Oak Ridge National Lab., Tenn.

AN INDIRECT COLORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM. D. L. Manning and J. C. White. Jan. 13, 1953. Decl. Nov. 22, 1955. 22p. Contract W-7405-eng-26. \$0.20(OTS).

An indirect colorimetric method has been developed for the determination of uranium in the range 50 to 400 γ in a volume of 50 ml. The method is based on the oxidation of uranium(IV) to uranium(VI) with iron(III) and determination of the iron(II) thus formed by application of the o-phenanthroline method. A concentration of 1 γ U/ml will produce an absorbancy of 0.08 in 1-cm cells. The standard deviation is 11%. Application has been made to carnotite ores, phosphate rocks, Bartow clay and organic and aqueous extracts. (auth)

Refer also to abstracts 3346, 3350, and 3351.

FLUORINE AND FLUORINE COMPOUNDS

3335 AECD-3705

Ames Lab., Ames, Iowa.

PILOT PLANT PRODUCTION OF THORIUM FLUORIDE. Norman Barson and Morton Smutz. July 1954. Decl. with deletions Nov. 29, 1955. 52p. W-7405-eng-82. \$0.35(OTS).

The pilot-plant production of ThF_4 by a wet process was investigated. The process consisted of dissolving $\text{Th}(\text{NO}_3)_4 \cdot 4\text{H}_2\text{O}$ in distilled H_2O , precipitating ThF_4 by addition of

aqueous HF, filtering the precipitate, and drying the fluoride to 0.1% moisture content. (auth)

3336 AECD-3708

Battelle Memorial Inst., Columbus, Ohio.

VAPOR PRESSURES OF BERYLLIUM FLUORIDE AND ZIRCONIUM FLUORIDE. K. A. Sense, M. J. Snyder, and J. W. Clegg. July 13, 1953. Decl. with deletions Nov. 22, 1955. 13p. Contract W-7405-eng-92. \$0.15(OTS).

The vapor pressures of BeF_2 and ZrF_4 were measured over the temperature ranges 746 to 968°C and 689 to 825°C, respectively, using the transpiration method. The respective extrapolated boiling points are shown to be 1159°C and 902°C. The melting point of BeF_2 is about 803°C. (auth)

GRAPHITE

Refer to abstract 3365.

LABORATORIES AND EQUIPMENT

3337 HW-39432

Hanford Atomic Products Operation, Richland, Wash.

OPERATIONAL CHARACTERISTICS OF SUBMERGED GAS-LIFT CIRCULATORS. M. W. Cook and E. D. Waters. Dec. 1, 1955. 130p. Contract W-31-109-Eng-52. \$19.80 (ph OTS); \$6.30(mf OTS).

Performance tests have shown that totally submerged gas-lift circulators offer an economic and effective means for achieving mild liquid agitation in large tanks. Riser pipe diameters from 3 to 15 in. and lengths from 3 to 24 ft were investigated. The effects of footpiece design, liquid temperature, liquid specific gravity, and the depth of liquid cover were also studied. Liquid flow was measured by means of instrumentation developed in this work. It is believed that the flow potential in a gas-lift circulator is the results of a reduction in the apparent specific gravity of the liquid. By equating this potential to the flow resistances, a general method for predicting circulator performance has been developed. The recommended operating range is from 400 to 1200 gpm/ft². In this range, a 10-foot long riser pipe will require from 0.003 to 0.008 ft³ of motive gas per gallon of cold liquid circulated. In a boiling liquid, the motive gas requirements are decreased by a factor of about 5. Satisfactory operation requires that the motive gas must be non-condensable. The advantages of replacing mechanical agitators with gas-lift circulators are discussed. (auth)

Refer also to abstract 3350.

RADIATION CHEMISTRY

3338 ANL-5206

Argonne National Lab., Lemont, Ill.

RADIATION CHEMISTRY OF NORMAL AND HEAVY WATER SOLUTIONS. I. RADIATION-INDUCED OXIDATION OF FERROUS SULFATE. William R. McDonell. Jan. 12, 1954. Decl. Dec. 2, 1955. 8p. Contract W-31-109-eng-38. \$0.15(OTS).

The Co^{60} gamma-ray-induced oxidation of FeSO_4 in 0.8N H_2SO_4 - D_2O solutions proceeds with a specific yield, $G_{\text{Fe}^{3+}}$, or 17.5, compared to 15.6 for H_2O solutions. Pile

irradiation yields show a similar but smaller enhancement of Fe^{3+} yields in D_2O solutions, the difference probably due to greater flux of capture gamma radiation in H_2O , than in D_2O solutions. (auth)

3339 ANL-5207

Argonne National Lab., Lemont, Ill.

RADIATION CHEMISTRY OF NORMAL AND HEAVY WATER SOLUTIONS. II. DECOMPOSITION OF HYDROGEN PEROXIDE BY GAMMA RADIATION. William R. McDonell. Jan. 11, 1954. Decl. Dec. 2, 1955. 10p. Contract W-31-109-eng-38. \$0.15(OTS).

The high intensity Co^{60} gamma-ray-induced decomposition of 10^{-4} M hydrogen peroxide proceeds at a rate initially 4.1 molecules/100 ev in D_2O solutions compared to 3.6 in H_2O solutions. Calculations of fundamental constants and a discussion of the mechanism of the reaction are presented. (auth)

SEPARATION PROCEDURES

3340 KAPL-180

Knolls Atomic Power Lab., Schenectady, N. Y.

A STUDY OF THE SEPARATION OF HAFNIUM AND ZIRCONIUM USING TTA. Dorothy C. McCarty, Burton E. Dearing, and John F. Flagg. Apr. 27, 1949. Decl. Nov. 22, 1955. 45p. Contract W-31-109-Eng-52. \$0.35(OTS).

A study of both hydrogen and TTA power dependencies in the hafnium extraction, complexing of hafnium by sulfate, nitrate, oxalate, and chloride ions, rate phenomena in both the hafnium and zirconium systems, and separation of hafnium and zirconium in mixtures are reported. Some of the published data on the zirconium extraction was rechecked. The experimental work on pure hafnium solutions is described first, followed by experiments on zirconium, and finally by work on separations. (auth)

3341 ORO-148

Texas. Univ., Austin. Sanitary Engineering Labs.

RECOVERY OF URANIUM FROM SALINE SOLUTIONS BY BIOLOGICAL SLIMES. Final Report. B. B. Ewing, W. R. Drynan, and E. F. Glynna. Oct. 1, 1955. 33p. Contract AT-(40-1)-1663. \$0.25(OTS).

The phenomenon responsible for the removal of uranium from a liquid and concentration upon biological material is a result of uranium utilization during metabolism, adsorption on the surface of the cell or absorption into the cell, and precipitation onto the zoogloal surfaces. It has been found in repeated tests that most of the uranium uptake effected by the biological sludge occurs within five or ten minutes of mixing. Violent mixing does not greatly improve uptake. The amount of suspended solids in biological suspensions has been found to influence the removal of uranium. The initial concentration of uranium in solution also effects the uptake. Usually the ratio of uranium recovered to sludge solids was lower for small initial concentrations. The biological activity of the sludge has been found to have an important effect on the concentration of uranium. (auth)

3342 RMO-2518

Rohm and Haas Co. Research Labs., Philadelphia.

RECOVERY OF URANIUM BY ION EXCHANGE RESINS. Sallie Fisher and Frank McGarvey. Mar. 17, 1953. Decl. Sept. 23, 1955. 37p. Contract AT-(49-1)-535. \$0.30(OTS).

An investigation was made of several aspects of the ion exchange operation. The selection of the optimum porosity resin, operation of optimum resin, Amberlite IRA-400, and the recovery of U in the eluate are summarized. (J.E.D.)

3343 RMO-2530

Rohm and Haas Co. Research Labs., Philadelphia.

USE OF ION EXCHANGE FOR THE SEPARATION OF URANIUM FROM IONS INTERFERING IN ITS COLORIMETRIC DETERMINATION. Sallie Fisher. May 24, 1954. Decl. Sept. 23, 1955. 32p. Contract AT(49-1)-535. \$0.25 (OTS).

In sulfate solutions uranium(VI) may be separated from the elements that interfere in its routine colorimetric analysis by absorbing it on an anion exchange resin (Amberlite IRA-400, 40-60 mesh) and subsequently eluting it with perchloric acid. The interference of metals such as Fe and V is eliminated by pre-reduction to forms not retained by the resin. As the procedure serves to concentrate as well as to separate uranium the analysis of very dilute solutions is made possible. (auth)

3344 WIN-17

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

INITIAL OPERATION OF NEW ACID LEACH RESIN-IN-PULP PILOT PLANT. C. K. McArthur, T. F. Izzo, and R. L. Shimmin. July 5, 1955. Decl. Sept. 19, 1955. 28p. Contract AT(49-6)-924. \$0.25(OTS).

The components and operation of the new acid leach Resin-in-Pulp (RIP) Pilot Plant and the results of a shake-down run are described. The new fourteen bank system proved to be practical in operation and highly efficient for uranium recovery from desanded ore pulps. (auth)

Refer also to abstract 3347.

URANIUM AND URANIUM COMPOUNDS

3345 BNL-2396

Brookhaven National Lab., Upton, N. Y.

NOTES ON THE EFFECT OF MAGNESIUM ON PROCESSING. J. Weisman. December 7, 1954. Decl. Nov. 16, 1955. 6p. Contract AT-30-2-Gen-16. \$0.15(OTS).

Preliminary results are reported from a number of experiments involving Mg. It was found that Mg has a small but appreciable effect on the solubility of U in Bi at 500°C. U and Th oxides are not reduced by Mg, but chlorides of U and Th are. Rare earths may be extracted from rare earth chlorides in molten Bi or Pb by adding Mg to the metal. A proposed flowsheet for Liquid Metal Fuel Reactor fuel processing is presented. (C.W.H.)

3346 K-1106

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

THE USE OF THE HIGH CURRENT MERCURY CATHODE IN URANIUM DETERMINATION. J. Gurney, T. W. Bartlett, E. D. Marshall, and R. H. Lafferty, Jr. Feb. 26, 1954. Decl. Nov. 30, 1955. 28p. Contract W-7405-Eng-26. \$0.25(OTS).

Electrolysis with a Hg cathode operating at 20 amp has been tested as a method for the rapid purification of U solutions prior to volumetric determination of the U. This high current Hg cathode is much faster than the conven-

tional type Hg cathode, and no further chemical purification is necessary prior to volumetric determination as is the case with solvent extraction. Statistically, no difference in precision could be shown in the volumetric determination of U in pure UO_2SO_4 solutions with no electrolysis and in UO_2SO_4 solutions containing Fe, Ni, and Cu which had been purified by electrolysis at 20 amp for 45 min. Deposition rates of Fe, Cu, and Ni into the Hg cathode were studied while controlling such variables as concentration, temperature, stirring, acidity, and anion concentration. (auth)

3347 MITG-A111

Massachusetts Inst. of Tech., Watertown, Mass.

Mineral Engineering Lab. and American Cyanamid Co. Atomic Energy Div. Raw Materials Development Lab., Winchester Mass.

CONSTRUCTION AND OPERATION OF AN AUTOMATIC DEVICE TO TEST RESIN LIFE. Fred N. Oberg. July 1, 1954. Decl. Oct. 19, 1955. 27p. Contracts W-7405-eng-85 and AT(49-1)-533. \$0.25(OTS).

The design and construction of an automatic machine to test resin life in U ion exchange are described. The machine, at predetermined times, stops the flow of pregnant solutions, eluant, and wash waters and separates the products. The results of testing resin through many cycles are reported. (C.W.H.)

3348 NAA-SR-926

North American Aviation, Inc. Downey, Calif.

THE DISTRIBUTION OF TRACER PLUTONIUM AND FISSION PRODUCTS BETWEEN MOLTEN URANIUM METAL AND MOLTEN URANIUM TETRAFLUORIDE.

A. G. Buyers, F. J. Keneshea, Jr., and R. A. Barney. June 1, 1954. Decl. Dec. 12, 1955. 26p. Contract AT-11-1-Gen-8. \$0.25(OTS).

A study has been made of the distribution of Pu and the principal fission products between molten U and fused U tetrafluoride. Plutonium and those fission products such as the rare earth metals and Cs, whose fluorides have free energies of formation more negative than UF_4 , were extracted into the salt. Fission products whose fluorides have free energies of formation more positive than that of UF_4 , such as Zr, Nb, and Ru remained largely in the U. (auth)

3349 ORNL-1419

Oak Ridge National Lab., Tenn.

APPLICATION OF X-RAY FLUORESCENCE TO ANALYSIS OF ZIRCONIUM IN URANIUM. W. F. Peed, W. B. Wright, Jr., and G. L. Rogosa. Dec. 6, 1952. Decl. Nov. 14, 1955. 15p. Contract W-7405-eng-26. \$0.20(OTS).

A rapid instrumental method of analysis for the determination of Zr in U has been developed and applied to a number of samples. Sources of error have been investigated and it is shown that the precision and accuracy compare favorably with conventional methods. Time of analysis for a single sample is less than 20 min and the effects of impurities are negligible. (auth)

3350 ORNL-2031

Oak Ridge National Lab., Tenn.

APPLICATION OF THE BECKMAN MODEL K AUTOMATIC TITRATOR TO THE POTENTIOMETRIC DETERMINATION OF URANIUM. C. D. Susano and J. S. Decker. Jan. 26, 1956. 20p. Contract W-7405-eng-26. \$3.30(ph OTS); \$2.40(mf OTS).

The applicability of the Beckman Model K Automatic Titrator for the determination of U was investigated to establish the utility of the instrument and to ascertain the optimum conditions for the titration. The automatic titrator was found to be satisfactory for the determination of U in the range of 20 to 100 mg. The precision established for U in this range was 0.2%. For smaller quantities of U the precision was about 0.5%. The optimum conditions that were established for titration are: potential "settings" of -80 mv and 640 mv at temperatures of 90 to 95°C; the use of a gauze electrode instead of a smooth electrode; and titration with 0.01N $K_2Cr_2O_7$ in solutions which are about 1N in H_2SO_4 . (auth)

3351 UCLA-30

California, Univ., Los Angeles. Atomic Energy Project. THE POSSIBLE USE OF PAPER CHROMATOGRAPHY AND RADIOACTIVE REAGENTS IN ULTRAMICRO INORGANIC ANALYSIS, WITH SPECIAL REFERENCE TO URANIUM AND PLUTONIUM. Robert M. Fink and Kathryn F. Fink. June 14, 1949. Decl. Dec. 6, 1955. 26p. Contract AT-04-1-GEN-12. \$0.25(OTS).

ENGINEERING

HEAT TRANSFER AND FLUID FLOW

3352 ANL-5522

Argonne National Lab., Lemont, Ill. THE EFFECT OF PRESSURE ON BOILING DENSITY IN MULTIPLE RECTANGULAR CHANNELS (thesis). J. F. Marchaterre. Feb. 1956. 90p. Contract W-31-109-Eng-38. \$0.50(OTS).

Submitted as a thesis to the Michigan Coll. of Mining and Tech.

The effect of pressure on the density of steam-water mixtures in natural circulation boiling in multiple rectangular channels was studied to 600 psig with saturated inlet conditions. The effect of pressure on flow rate was also studied. The ratio of the velocity of the steam to the velocity of the water was found to be correlated by the inlet velocity. For a fixed average steam volume fraction, no effect of pressure on flow rate could be found. Neither velocity ratio nor steam volume fraction could be correlated in terms of quality if a sufficient velocity range was studied. The assumption of constant velocity ratio over the channel length seems to be valid. (auth)

3353 K-1264

Oak Ridge Gaseous Diffusion Plant, Tenn. VELOCITY PROFILES AND FRICTION FACTORS FOR TURBULENT PIPE FLOW WITH UNIFORM WALL SUCTION. H. L. Weissberg. Apr. 17, 1956. 31p. Contract W-7405-eng-26. \$6.30(ph OTS); \$3.00(mf OTS).

Experimental data have been analyzed to obtain empirical formulas for the distribution of velocity and of the wall shear stress in turbulent flow in a porous pipe with uniform wall suction. The results describe the velocity profiles in the wall region and in the inner region of the pipe and specify the variation of the friction factor with both the local Reynolds number and the suction rate. The data which have been analyzed cover the Reynolds number range between about 25,000 and 63,000 with ratios of suction velocities to axial velocities between zero and about 0.005. (auth)

MATERIALS TESTING

3354 NYO-3738

Columbia Univ., New York.

INVESTIGATION OF "ANTI-WHIRL" BEARINGS FOR OPERATING IN AN ACIDIC SOLUTION CONTAINING ABRASIVE PARTICLES. Final Report for Period November 1, 1954 to May 31, 1955. Carl F. Kayan, Gilbert F. Boeker, and Dudley D. Fuller. Mar. 1956. 14p. Contract AT(30-1)-1274, Extension. \$0.15(OTS).

"Anti-whirl" bearings which consisted of synthetic acid-resistant rubber in a modified bearing form in contact with abrasive solutions were tested and showed little evidence of wear. The bearings which used a ceramic mechanical face seal gave excessive wear rates in abrasive solutions. (For preceding period see NYO-3737.) (C.W.H.)

MINERALOGY, METALLURGY, AND CERAMICS

CORROSION

3355 ANL-5500

Argonne National Lab., Lemont, Ill.

CORROSION EXPERIMENTS WITH 2S ALUMINUM AT 200°C. W. E. Ruther. Mar. 1956. 12p. Contract W-31-109-eng-38. \$0.20(OTS).

Aqueous corrosion experiments using 2S Al at 200°C showed the following. Lowest corrosion rates were obtained in dilute sulfuric acid at pH near 3. This was also true at 250 and 300°C. The same amount of sulfate ion in neutral solution caused no significant reduction in corrosion. Dichromate ion and dissolved O increased in corrosion rate (neutral pH). Sodium silicate as a solute resulted in higher corrosion rate when the pH was lowered only to 9.4; at pH 3.5 it reduced the corrosion rate significantly. Chloride ion (5 ppm) caused some pitting and increased the corrosion rate slightly. Coupling to more cathodic materials such as graphite and Zr caused no noticeable effect on the Al corrosion in distilled H_2O . (auth)

3356 BMI-819

Battelle Memorial Inst., Columbus, Ohio.

THE CORROSION OF THORIUM IN AIR. M. W. Mallett and W. M. Albrecht. Apr. 22, 1953. Decl. Nov. 22, 1955. 18p. Contract W-7405-eng-92. \$0.15(OTS).

The corrosion of thorium in air in the range 100 to 900°C follows a linear reaction rate and is principally an oxidation process. Two energies of activation were found, 13 kcal/mole for the 100 to 200°C range, and 18 kcal/mole for the 400 to 900°C range. These activation energies are probably caused by different rate-determining steps in the corrosion process. (auth)

METALS AND METALLURGY

3357 ANL-5545

Argonne National Lab., Lemont, Ill.

AN ULTRASONIC "JACK HAMMER" FOR REMOVAL OF INCLUSIONS. George L. Kehl, Hyman Steinmetz, and

Warren J. McGonnagle. Mar. 1956. 12p. Contract W-31-109-eng-38. \$0.20(OTS).

A mechanical method for removing inclusions of minimum diameter ($\sim 10 \mu$) from metals and alloys by means of a pointed stylus oscillating at ultrasonic frequencies is described. (auth)

3358 BMI-757

Battelle Memorial Inst., Columbus, Ohio.

ELECTROPLATING ON ZIRCONIUM AND ZIRCONIUM-TIN. W. C. Schickner, J. G. Beach, and C. L. Faust. July 1, 1952. Decl. Nov. 30, 1955. 17p. Contract W-7405-eng-92.

Methods are described for electroplating Ni on Zr and Zr-Sn alloys with as-plated adhesion $> 6,000$ psi, and heat treating to produce alloy-diffusion bonds of 50,000 psi. This supplements the results previously reported. Other metals can be electroplated over Ni, diffusion bonded to the Zr or Zr alloy. A method of preparing Zr for Sn, Pb-Sn solder, and Ag-solder coating is also described. Other metals can be electrodeposited on these coatings. (auth)

3359 BMI-833

Battelle Memorial Inst., Columbus, Ohio.

A HOT-HARDNESS SURVEY OF THE ZIRCONIUM-URANIUM SYSTEM. W. Chubb, G. T. Muehlenkamp, and A. D. Schweppe. May 28, 1953. Decl. Nov. 22, 1955. 16p. Contract W-7405-eng-92.

A complete hardness survey of the zirconium-uranium system has been made at temperatures from room temperature to 900°C . The composition of maximum hardness increases from 40 at.% zirconium at room temperature to 60 at.% zirconium at 600°C . At 700°C , the hardness data indicated the presence of the beta uranium phase in alloys containing 95 and 100 at.% uranium. This phase was found to be unusually hard. At 900°C , maximum hardness of the gamma zirconium-uranium solid solution was found to occur at about 50 at.%. (auth)

3360 HW-40866

Hanford Atomic Products Operation, Richland, Wash. NOTCH SLOW-BEND TESTING OF ZIRCALOY-2. R. G. Wheeler. Jan. 24, 1956. 20p. Contract W-31-109-Eng-52. \$3.30(ph OTS); \$2.40(mf OTS).

A recording notch slow-bend tester that plots bending moment versus angle of bend is described. Testing from room temperature to 450°C is possible with this equipment by resistance heating the specimen. The effects of notch and specimen geometry on test results are evaluated with Zircaloy-2 test specimens. Typical applications of the instrument are illustrated using Zircaloy-2 specimens to show how changes in temperature and cold work affect the bend test properties. The notch bend test described has the advantage of rapidly detecting small changes in brittleness and other mechanical properties using inexpensive equipment with a minimum of material and with essentially no specimen machining. These features make this type of test particularly applicable to examination of irradiated metals. (auth)

3361 NBS-4032

National Bureau of Standards, Washington, D. C. ALLOYING THEORY. Progress Report. R. W. Buzzard. Apr. 11, 1955. 15p. Project No. 0802-10-4100. \$0.20(OTS).

It has been shown that the ionic parameters may be ap-

plied to solubility data for binary alloy systems. An approach to the problem of polyvalent metals on a reasonable basis using precise data was developed. The compatible ionic states of the metallic elements derived by empirical methods, give a clue to their alloying characteristics, thereby eliminating the ever present valency problem. It has been shown that this approach is equally applicable to both the simple metals and to the more complex metals of the transition series. In general, sufficient preliminary data have been presented to warrant an extensive investigation of this new approach to alloying theory. No claim to conclusive data has been presented and only generalizations have been drawn from a rather limited preliminary survey. (auth)

3362 SEP-127

Bridgeport Brass Co., Conn.

FABRICATION OF ZIRCONIUM SHELLS. Technical Progress Report for October 1951-October 1952. R. S. French, C. H. Mayer, and R. S. Pratt. Dec. 31, 1952. Decl. Nov. 18, 1955. 98p. [For Sylvania Electric Products Inc.] Contract AT-30-1-Gen-366, Sub-S-AEC-1. (BBCO-F-400) \$0.30(OTS).

Metallurgical and mechanical property data for arc-melted crystal bar and sponge Zr are given. Deep drawing test results are reported for cupping, folding, and ironing. Satisfactory metal reduction procedures were determined. (J.E.D.)

3363 TID-5116

Massachusetts Inst. of Tech., Cambridge.

STUDY OF THE CHARACTERISTICS OF THE CORROSION FILM ON ZIRCONIUM USING POLARIZED LIGHT (thesis). Nels Roland Nelson and John Wade Heintz. May 16, 1952. Decl. Oct. 7, 1955. 216p. Contract [AT(30-1)-981]. \$1.00(OTS).

The effects of N_2 on the corrosion resistance of Zr in distilled H_2O at 450 and 560°F were studied, using polarized light. Inconclusive results were obtained due to experimental limitations. (C.W.H.)

3364 AEC-tr-2432

THE DIFFUSION OF CHROMIUM IN NICKEL BASE SOLID SOLUTIONS. P. L. Gruzin and G. B. Fyedorov. Translated from Doklady Akad. Nauk S.S.R. 105, 264-7(1955). 7p.

PHYSICS

3365 ANL-5524

Argonne National Lab., Lemont, Ill.

THE STRUCTURE AND PROPERTIES OF ARTIFICIAL AND NATURAL GRAPHITE. T. J. Neubert, J. Royal, and A. R. Van Dyken. Feb. 1956. 44p. Contract W-31-109-eng-38. \$0.30(OTS).

The physical, chemical, structural, electrical, and thermal properties of natural artificial graphite are tabulated and discussed. (D.E.B.)

3366 BMI-849

Battelle Memorial Inst., Columbus, Ohio.

THERMAL CONDUCTIVITY OF ZIRCONIUM AND ZIRCONIUM-TIN ALLOYS. H. W. Deem. July 10, 1953. Decl. Nov. 22, 1955. 9p. Contract W-7405-eng-92.

The thermal conductivities of zirconium-tin alloys and

a zirconium-uranium-tin-iron-chromium-nickel alloy were measured over the temperature range 50 to 400°C. Thermal-conductivity values at 300°C ranged from 0.19 watts/(cm)(C) for unalloyed zirconium to 0.11 watts/(cm)(C) with 7 wt.% tin. At lower temperatures the spread is greater. (auth)

3367 ISC-707

Ames Lab., Ames, Iowa.

SEMI-ANNUAL SUMMARY RESEARCH REPORT IN PHYSICS FOR JULY THROUGH DECEMBER 1955. Mar. 8, 1956. 29p. Contract W-7405-eng-82. \$0.25(OTS).

Studies of Dy magnetic properties were continued. The apparent existence of a ferromagnetic-antiferromagnetic transition at 85°K is discussed. Radiation studies on Br⁸² have led to a proposed decay scheme containing eight γ rays. Results are given of β - γ directional correlation measurements on Re¹⁸⁶, Pr¹⁴², and La¹⁴⁰. Discrepancies in fission fragment energy measurements due to the nature of ionization chamber gases have been predicted. A search for these discrepancies using natural U fission and A and He gases gave results in accordance with theoretical predictions. Research on isomeric states led to the energy and lifetime determination of isomeric transitions for W, Lu, Er, Ho, Nd, and Pr. Diffusivity-temperature curves for Armco iron and U were established. Resistivity, Hall coefficients, and Hall mobility as a function of temperature have been plotted for Mg₂Ge. (For previous period see ISC-645.) (D.E.B.)

3368 NAA-SR-268

North American Aviation, Inc., Downey, Calif.

SOLID STATE AND IRRADIATION PHYSICS QUARTERLY PROGRESS REPORT FOR APRIL-JUNE 1953. F. E. Faris and E. C. Crittenden, Jr., ed. Aug. 21, 1953. Decl. Nov. 16, 1955. 51p. \$0.35(OTS).

The specific heat of graphite was investigated by a computation of the inplane vibrational modes, with a Born-von Karman model. The thermal and electrical conductivities of graphitized lampblack were determined as a function of temperature (10 to 300°K) and neutron irradiation (up to 460 Mwd/ct). Changes in Peierls' diamagnetism and paramagnetism from interstitials in graphite were evaluated as a function of neutron irradiation up to 1534 Mwd/ct. Measurements of radiation damage as a function of depth were obtained for AWG graphite by noting changes in the resistivity and thermoelectric power with depth for cyclotron-irradiated samples. A scatter in the plot of the normalized resistivity in graphite is so great that correlations may be made with annealing temperatures as well as activation temperatures. Proton irradiation effects on AuCu₃ alloy were studied. Other data indicate that the Debye temperature of ordered AuCu₃ is about 175°K, increasing on ordering to 200°K. Indentation tests on the surface hardness changes of X Cu irradiated by 1-Mev electrons are reported, together with data on the thermal annealing of radiation induced hardness in KCl and NaCl. An experimental arrangement is described for measuring the mass transfer of radioactivity in a Na-stainless steel corrosion loop. (K.S.)

3369 NYO-7485

Franklin Inst. Labs. for Research and Development, Philadelphia.

THE INTRINSIC DIELECTRIC CONSTANT. R. S. Smith and F. E. Jaumot, Jr. Mar. 1956. 17p. Contract AT(30-1)-1484. \$3.30(ph OTS); \$2.40(mf OTS).

A formulation for the intrinsic dielectric constant is presented. The momentum method of quantum mechanics is used so that the development is related directly to the method of calculating Brillouin zones. (auth)

Refer also to abstract 3329.

ELECTRICAL DISCHARGE

3370 AEC-tr-2429

LIGHT EMISSION FROM HIGH VACUUM GAS DISCHARGES. K. H. Reiss. Translated by K. Bevis from *Z. angew. Phys.* 7, 433-7(1955). 10p.

With the help of a powerful spectral apparatus consisting of an interference filter, a secondary electron multiplier and a recording instrument, the spectra of extremely diluted gases are recorded. A separately constructed ionization manometer with cold electrodes is used as the light source. Studies are confined to commercial gases. It can be used to detect traces of hydrocarbons, mercury and nitrogen. The method is also suitable for testing the air-tightness of high vacuum apparatus and for detecting leaks, e.g. with A. The sensitivity is limited only by fluctuations in the discharge light and by the interference noise of the light receiver. A spectral analysis at 10⁻⁷ mm is possible with the light source described, so N partial pressures of 3.10⁻⁹ mm can be determined. The getter action of the discharge interferes when the gas is changed quickly. (auth)

GASES

3371 AEC-tr-2426

THE EXTERNAL FRICTION OF GASES. W. Gaede. Translated from *Ann. Physik* (4), 41, 289-336(1913). 48p.

Experimental and calculated values of external friction for gases flowing through glass are investigated at very low pressures using H₂ and N. The experimental technique and equipment are discussed, and the results compared with previously reported values. (D.E.B.)

MATHEMATICS

3372 WAPD-TN-524

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. MOEBIUS INVERSION OF FOURIER TRANSFORMS. R. R. Goldberg and R. S. Varga. Jan. 1956. 22p. Contract AT-11-1-GEN-14. \$0.25(OTS).

A method of inverting $F(t) = \int_0^\infty \varphi(u) \cos tu du$ which uses no numerical integration is developed. The method consists of a combination of the Moebius Inversion Formula and Fourier analysis. (D.E.B.)

MEASURING INSTRUMENTS AND TECHNIQUES

3373 BNL-379

Brookhaven National Lab., Upton, N. Y. BETA-GAMMA HAND AND FOOT MONITOR UTILIZING 10-DIGIT DEKATRONS. J. D. Chester and J. S. Handloser. Oct. 1955. 8p. \$0.10(OTS).

A beta-gamma hand and foot monitor utilizing Dekatron type GC10B glow transfer counter tubes has been con-

structed. The number of channels has been reduced from the usual five to three and mechanical registers have been eliminated. The complete circuit is shown. (auth)

3374 K-1277

Oak Ridge Gaseous Diffusion Plant, Tenn.

A HIGH SENSITIVITY BETA-GAMMA PROBE FOR USE WITH THE SAMSON SURVEY METER. T. J. Lewis. Apr. 13, 1956. 16p. Contract W-7405-eng-26. \$0.20(OTS).

A high-sensitivity beta-gamma probe, which connects to the Samson Alpha Survey Meter by extension cable, has been developed. The probe was designed to operate in beta or gamma fields of strengths equivalent to 625 mr/hr. The complete instrument is suitable for general health physics survey work, and can be used to replace the separate GM-type and Cutie Pie instruments heretofore utilized. (auth)

3375 MLM-373

Mound Lab., Miamisburg, Ohio.

COUNTING TECHNIQUE STUDIES II. DISCREPANCY IN ALPHA COUNTING INSTRUMENTS. (An Interim Report). Mary Lou Curtis. Apr. 8, 1949. Decl. Dec. 9, 1955. 43p. Contract AT-33-1-gen-53. \$0.30(OTS).

Results are reported from a comparison of radiometric and geometric calibrations of the Logacs-S low-geometry short-tube α counter and the Simpson No. 1 methane flow proportional α counter. (C.H.)

NEUTRONS

3376 BNL-2028

Brookhaven National Lab., Upton, N. Y.

THE TRANSMISSION OF NEUTRONS AND GAMMA-RAYS THROUGH AIR SLOTS. PART X. THE ANGULAR DISTRIBUTION OF THE NEUTRONS EMERGING FROM AN AIR SLOT. Robert D. Schamberger, Ferdinand J. Shore, and Harvey P. Sleeper, Jr. Sept. 1, 1954. Decl. Nov. 21, 1955. 13p. Contract AT-30-2-Gen-16. \$0.20(OTS).

The angular distribution and the spectrum of neutrons emerging from the end of an air slot in water are important in interpreting a number of different experiments involving one or more air slots. For example, the attenuation in water beyond an air slot and the effect of a step in an air slot are functions of both the angular distribution and the spectrum of the radiation. Several experiments have been performed to study the angular distribution in a qualitative manner. These studies have included an investigation of the effect of inserting scattering material near the middle of a 0.5 inch thick by 48 inch long air slot, as well as experiments to measure the attenuation of fast and slow neutrons in water and in air above the top of a long, thin air slot. (auth)

3377 DP-64

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

NEUTRON ENERGY SPECTRA IN WATER. H. Dean Brown. Feb. 1956. 19p. Contract AT(07-2)-1. \$0.20(OTS).

Neutron energy spectra are computed for homogeneous reactors moderated by heavy water or by light water. The effects of chemical binding, of moderator motion, and of neutron absorption are considered. A formula is given for the temperature of the thermal region of the spectrum as a function of absorption and moderator temperature. (auth)

3378 TID-5087

Mound Lab., Miamisburg, Ohio.

PREPARATION, PROPERTIES, AND AVAILABILITY OF POLONIUM-NEUTRON SOURCES. Information Report. July 1952. Decl. Nov. 29, 1955. 40p. Contract AT-33-1-GEN-53. (MLM-641). \$0.25(OTS).

The most commonly used neutron source, Po-Be, is prepared by volatilizing Po into a source container and adding Be in powdered form. These sources are then sealed with Ni or stainless steel coats. Neutron counting and shielding are discussed and tables of neutron yield, Po decay, and α -n energy balance are given. The effects of Po-Be ratios and neutron absorption in absorbents are plotted. (D.E.B.)

NUCLEAR PHYSICS

3379 NAA-SR-1016

North American Aviation, Inc., Downey, Calif.

REACTOR PHYSICS QUARTERLY PROGRESS REPORT FOR FEBRUARY-APRIL 1954. R. A. Laubenstein, ed. Aug. 1, 1954. Decl. Nov. 9, 1955. 16p. Contract AT-11-1-GEN-8. \$0.20.

A measurement of the anisotropy in the diffusion of neutrons in a U rod lattice has been obtained by comparing the buckling measured using exponential assemblies of two different diameters. A small anisotropy has been observed. The measurements of intracell flux distribution and buckling for slightly enriched (0.9%) U lattices in D_2O were extended to include a lattice of 1-in. diameter U rods on a 6-in. square spacing. Other measurements include the attenuation of fast neutrons in D_2O , thermal neutron disadvantage factors in Th rods, the attenuation of In resonance neutrons by Cd, and the self depression of thermal neutron flux by the foils used for flux distribution measurements. The danger coefficient technique was used with the water boiler neutron source to compare the absorption cross sections of 18 samples of Be of known purity. Consistency of the measurements indicates that present techniques give a probable error of 0.002 cm^2 in cross section comparisons of this type. (auth)

NUCLEAR PROPERTIES

3380 ANL-5525

Argonne National Lab., Lemont, Ill.

FIRST FORBIDDEN NON-UNIQUE BETA TRANSITIONS IN Re^{186} : TECHNIQUES IN COINCIDENCE SPECTROSCOPY. F. T. Porter, M. S. Freedman, T. B. Novey, and F. Wagner, Jr. Feb. 1956. 92p. Contract W-31-109-eng-38. \$15.30(ph OTS); \$5.40(mf OTS).

The β spectrum of the main inner group of 89.0- hr Re^{186} ($E_0 = 934.3 \pm 1.3$ kev; 24% of total betas; $\log ft = 8.0$) has been magnetically analyzed in coincidence with the 137.2-kev gamma. The observed spectrum does not have the allowed shape nor the unique ($\Delta I = 2$, yes) shape; its spectrum shape correction factor increases ca 18% from 150 kev to 900 kev. Subtraction of this spectrum, weighted with its measured relative abundance, from the composite spectrum, produces the spectrum of the ground state transition ($E_0 = 1071.5 \pm 1.3$ kev; 76% of total betas; $\log ft = 7.68$). Its similarly non-allowed, non-unique shape factor increases by ca 22% from 150 kev to 1050 kev. Both transitions are

interpreted as first forbidden ($\Delta I = 1$, yes); Re^{186} is assigned a ground state spin and parity 1(-). A theoretical parametric fitting of these spectra with the combination of scalar and tensor beta interactions is demonstrated; the limited ranges of the fitting parameters, which are functions of the nuclear matrix elements, are obtained. A comparison is presented between the theoretical fittings of the beta spectrum of the inner group and of the β - γ angular correlation. Pursuant to these studies on Re^{186} values were obtained for the maximum β energies (see above), γ energies, conversion coefficients, half-life, and branching ratios, particularly of the ca 0.1% abundant 307-kev beta group. Discussions are given on the criteria for evaluating the performance of a coincidence spectrometer, particularly the coincidence efficiency as a function of β energy, and present an analysis of some corrections to coincidence data usually not considered. The performance of the apparatus is exemplified by the spectrum of the main β transition in Au^{186} ($E_0 = 960$ kev) in coincidence with the 411-kev gammas. In appendices a generalized treatment of the correction for finite spectrometer resolution and the correction to coincidence spectrometer measurements arising from the β - γ directional correlation are given.

(auth)

NUCLEAR REACTORS

3381 AECD-3715

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

IMPROVEMENTS IN MTR FUEL ASSEMBLIES AND OPERATING PROCEDURES. C. F. Leyse. Feb. 1, 1954. Decl. with deletions Dec. 9, 1955. 14p. Contract AT(10-1)-205. \$0.15(OTS).

The changes in fuel assemblies, shim rods, core geometry, and reactor cycle that have been made since the MTR was placed in operation have been summarized. These changes have reduced the cost of fabricating fuel for the reactor from an initial value of \$51.8/Mwd to about \$14.5/Mwd at present. Some ways in which further improvements might be realized are summarized briefly.

(auth)

3382 AECD-3716

Oak Ridge National Lab., Tenn.

TWO NEUTRON ENERGY MEASUREMENTS IN THE BULK SHIELDING FACILITY USING RADIOACTIVANTS. J. B. Trice, F. J. Muckenthaler, F. W. Smith and E. B. Johnson. Oct. 29, 1953. Decl. Nov. 23, 1955. 28p. Contract W-7405-eng-26. (CF-53-5-139).

A series of measurements was made in the BSF in order to compare results from proton-recoil measurements, at a reactor operating power of 100 kw. Threshold measurements were obtained in the 1- to 8-Mev range by the use of (n,p) and (n, α) reactions with Al^{27} , Mg^{24} , Si^{28} , S^{32} , P^{31} , and Cl^{35} . The spectral form in this case is similar to a fission spectrum as given by Watt's experimental data. Similar measurements using (n, γ) reactions with Mn^{55} , Cu^{63} , Na^{23} , Cl^{37} , and V^{61} in the energy range 0.0001 to 0.05 Mev are in good agreement with a 1/E spectral function. Whereas spectral structure was discernible only by proton-recoil measurements, the absolute magnitudes from the two methods are comparable. In a second series of tests to measure (n,p) cross sections in O^{16} and O^{17} , neutron flux traverses in the BSF are reported, using Al , Mg ,

S , Co , and Au radioactivants, placed along a special fuel element through which a controlled quantity of H_2O flowed. (K.S.)

3383 AECD-3719

Oak Ridge National Lab., Tenn.

ANALOG SIMULATION IN THE PACKAGE REACTOR STUDY. E. R. Mann and F. P. Green. May 15, 1954. Decl. Nov. 23, 1955. 15p. Contract W-7405-Eng-26. (CF-54-1-104). \$0.20(OTS).

The 10 megawatt Package Reactor power plant was examined by means of the ORNL Reactor Power Plant Simulator. The system simulated in a block diagram is described, the design point parameters are given certain simplifying assumptions used for approximations. Data in the form of curves showing responses of mean fuel temperature, mean coolant temperature and reactor power to perturbations in $\Delta k/k$ and power load are also given.

(auth)

3384 ANL-5379

Argonne National Lab., Lemont, Ill.

THE FAST EXPONENTIAL EXPERIMENT. F. H. Martens. Nov. 1955. 116p. Contract W-31-109-eng-38. \$0.60(OTS).

The Fast Exponential Experiment was set up in order to study the properties of a reactive system utilizing fast neutrons. The experiment consisted of a source pile of U^{235} moderated with H_2O to provide neutrons to the exponential assembly, and the assembly itself. A U slab was located between these two systems to absorb thermal and resonance neutrons from the source pile. Complete descriptions of these systems are included. Data are given from preliminary studies using this system. These include flux distribution measurements, reflector studies, and shielding studies. Descriptions are also given of fission chambers, flux monitors, and catcher foils to be used with the assembly. The theory of buckling is briefly discussed, and results of buckling calculations for an enriched exponential core are given. Exponential measurements of buckling are also described. Measurements of reflector savings and fission ratios are also described. Data on equilibrium neutrons in natural U are included in appendices. (B.J.H.)

3385 BMI-T-54

Battelle Memorial Inst., Columbus, Ohio.

AN EVALUATION OF HEATING METHODS FOR THERMAL-RUPTURE TESTS OF CERAMIC FUEL ELEMENTS. F. C. Todd, S. L. Fawcett, W. H. Duckworth, and H. Z. Schofield. Dec. 31, 1950. Decl. Nov. 30, 1955. 29p. Contract W-7405-eng-92. \$0.25(OTS).

In the problem of determining the susceptibility of ceramic fuel elements to failure under thermal stress, the common method of applying heat along the axis of a cylindrical tube of the test material and cooling it externally to produce a steady-state thermal difference and resulting thermal stress is believed to be reasonably satisfactory for comparing the thermal-rupture characteristics of different materials. It is not generally suitable, however, for determining the effect of shape on the susceptibility to rupture. For this purpose, it is necessary to devise a method of producing heat uniformly within the test structure. Methods of accomplishing this heating, without resorting to in-pile experiments, are considered. Resistance heating of a "ceramic-like" material appears to be the most promising method. The electrical characteristics

needed in this material suggest the possible utility of sintered powder mixtures of ceramic oxides and metals. (auth)

3386 BNL-130

Brookhaven National Lab., Upton, N. Y.

WATER-SPRAY COOLING OF AIR-COOLED PILES; AN OUTLINE OF PROBLEMS ENCOUNTERED AND POSSIBLE SOLUTIONS. Melville Clark, Jr. Oct. 1950. Decl. Nov. 23, 1955. 37p. \$0.30(OTS).

The major problem involved in cooling a pile with water spray is probably that of getting the drops fine enough to avoid impaction. If the air flows in one direction through a gapless pile, then impaction is much less serious, and larger particles can be permitted. Furthermore, the water drops in this kind of reactor will be considerably more effective in cooling than in the gap type of pile. The reason for this is that the water drops lower the temperature of the air to the saturation temperature. In a pile with a central gap the metal is near its maximum where the air is coldest and, hence, the air cannot be cooled much by the water droplets. In reactors in which air flows in one direction, the air temperature where the metal is hottest can be very appreciably lowered, because the air temperature is appreciably above the saturation temperature. If water-spray cooling were to be used with the split pile, then one should experimentally measure the maximum particle size allowable and explore methods of making such small particles. Of the methods considered in this report, gas atomizing nozzles or the isentropic expansion of saturated air appears the most promising. The effect of various size drops on the heat transfer coefficient from a metal to air would be a study interesting by itself, as well as useful in our present study, although it is doubtful if this coefficient would be materially increased for drops of the fineness required. The rate of scale formation on the various parts of the pile structure perhaps merits experimental checking, even though Brookhaven water is very pure. If the drops are introduced in the inlet air ducts, then the corrosion of various metal parts should be studied. The problems of agglomeration, radioactivity, and pumping power are either unimportant or readily surmountable. (auth)

3387 BNL-364

Brookhaven National Lab., Upton, N. Y.

ANNUAL REPORT—JULY 1, 1955. 156p. Contract AT-30-2-GEN-16. \$0.75(OTS).

The progress and trends of the research program of the Brookhaven National Laboratory are presented along with a description of the operational, service and administrative activities. The activities of the laboratory service organizations are reported in detail whereas research activities are covered only in summary. (For preceding period see BNL-303.) (J.E.D.)

3388 BNL-1149

Brookhaven National Lab., Upton, N. Y.

SERIAL REPORTS ON START-UP EXPERIMENTS. NO. 1. THE HOT ROD EXPERIMENT. J. Chernick and J. W. Kunstadter. Nov. 29, 1950. Decl. Nov. 14, 1955. 16p. Contract AT-30-2-Gen-16. \$0.20(OTS).

Calculations indicated a change in reactivity with fuel rod temperature. Experiments using pre-heated rods were designed for measuring this change. These experiments are described, the results tabulated, and the temperature coefficient determined. (D.E.B.)

3389 BNL-1151

Brookhaven National Lab., Upton, N. Y.

SERIAL REPORTS ON START-UP EXPERIMENTS. NO. 4. THE SIMULATED BAROMETRIC COEFFICIENT. Jack Chernick. Feb. 15, 1951. Decl. Nov. 14, 1955. 9p. Contract AT-30-2-Gen-16.

The barometric coefficient of a reactor was determined in the past by following the change in reactivity due to variations in atmospheric pressure. These changes are normally small and it has therefore been difficult to obtain an accurate measurement of the barometric coefficient. For this reason, it was decided to use the reactor fans to simulate the barometric effect. By sealing the inlet air ducts and operating one or more fans, a uniform pressure drop ranging from 15 to 53 mm Hg could be maintained over the reactor. These pressure changes are much greater than would be provided by the most severe weather conditions. The results of the experiment are tabulated showing the critical rod positions under the different pressure conditions, and the reactivity changes involved. (J.E.D.)

3390 BNL-1339

Brookhaven National Lab., Upton, N. Y.

SERIAL REPORTS ON START-UP EXPERIMENTS. NO. 3. THE SUBCRITICAL BAROMETRIC COEFFICIENT OF THE BNL REACTOR. J. Chernick and I. Kaplan. Feb. 1, 1951. Decl. Nov. 14, 1955. 12p. Contract AT-30-2-Gen-16.

Results of a study of the effects of barometric changes on reactor criticality are given and discussed. Though inconclusive, the data indicate the expected correlation of atmospheric pressure and neutron density. (D.E.B.)

3391 BNL-1785

Brookhaven National Lab., Upton, N. Y.

REACTIVITY COEFFICIENT MEASUREMENT OF BUCKLING. Kenneth W. Downes and Herbert J. Kouts. Mar. 18, 1954. Decl. Nov. 9, 1955. 10p. Contract AT-30-2-Gen-16.

Exponential measurements on H_2O -slightly enriched U lattices are reported. A volume ratio of 3:1 and U enrichment of 1.15% is used. (D.E.B.)

3392 BNL-2016

Brookhaven National Lab., Upton, N. Y.

BUCKLING OF A NATURAL URANIUM LIGHT WATER MODERATED LATTICE. K. Downes. Aug. 23, 1954. Decl. Nov. 9, 1955. 8p. Contract AT-30-2-Gen-16.

Pile parameters for a natural U- H_2O lattice having a 1.5 H_2O -to-U ratio were measured. The best M^2 value for this pile was found to be 33 cm^2 , giving a k_{∞} of 0.989. (D.E.B.)

3393 BNL-2019

Brookhaven National Lab., Upton, N. Y.

THE TRANSMISSION OF NEUTRONS AND GAMMA-RAYS THROUGH AIR SLOTS. PART I. THE MECHANICAL CONSTRUCTION OF THE SLOTS AND REPRESENTATIVE BACKGROUND DATA. Robert D. Schamberger, Ferdinand J. Shore, Harvey P. Sleeper, Jr. Sept. 1, 1954. Decl. Nov. 21, 1955. 20p. Contract AT-30-2-Gen-16.

A series of experiments to determine the neutron and gamma transmission characteristics of rectangular air slots will be discussed in a series of 10 reports. Established criteria for the design of the experimental equipment are described here. The apparatus allows for maximum flexibility in varying the slot shape, using a variety of test materials. Some preliminary results are included. (K.S.)

3394 BNL-2021

Brookhaven National Lab., Upton, N. Y.

THE TRANSMISSION OF NEUTRONS AND GAMMA-RAYS THROUGH AIR SLOTS. PART III. THE TRANSMISSION OF GAMMA-RAYS THROUGH STRAIGHT AIR SLOTS IN WATER. Robert D. Schamberger, Ferdinand J. Shore, and Harvey P. Sleeper, Jr. Sept. 1, 1954. Decl. Nov. 21, 1955. 15p. Contract AT-30-2-Gen-16.

3395 BNL-2023

Brookhaven National Lab., Upton, N. Y.

THE TRANSMISSION OF NEUTRONS AND GAMMA-RAYS THROUGH AIR SLOTS. PART V. THE EFFECT OF THE VERTICAL POSITION OF A SINGLE OFFSET ON THE NEUTRON TRANSMISSION OF AN AIR SLOT. Robert D. Schamberger, Ferdinand J. Shore, and Harvey P. Sleeper, Jr. Sept. 1, 1954. Decl. Nov. 21, 1955. 8p. Contract AT-30-2-Gen-16.

3396 BNL-2024

Brookhaven National Lab., Upton, N. Y.

THE TRANSMISSION OF NEUTRONS AND GAMMA-RAYS THROUGH AIR SLOTS. PART VI. THE EFFECT OF MULTIPLE OFFSETS ON THE NEUTRON TRANSMISSION OF AN AIR SLOT. Robert D. Schamberger, Ferdinand J. Shore, and Harvey P. Sleeper, Jr. Sept. 1, 1954. Decl. Nov. 21, 1955. 12p. Contract AT-30-2-Gen-16.

3397 BNL-2027

Brookhaven National Lab., Upton, N. Y.

THE TRANSMISSION OF NEUTRONS AND GAMMA-RAYS THROUGH AIR SLOTS. PART IX. THERMAL AND EPITHERMAL NEUTRON DISTRIBUTIONS AROUND AN AIR SLOT IN WATER. Robert D. Schamberger, Ferdinand J. Shore, and Harvey P. Sleeper, Jr. Sept. 1, 1954. Decl. Nov. 21, 1955. 11p. Contract AT-30-2-Gen-16.

3398 BNL-2184

Brookhaven National Lab., Upton, N. Y.

BUCKLING OF LIGHT-WATER MODERATED LATTICES OF .387" DIAMETER, 1.027% ENRICHED URANIUM RODS. H[erbert J. C.] Kouts, G[len A.] Price, K[enneth W.] Downes, R[udolph] Sher, and V[alentine J.] Walsh. Feb. 7, 1955. Decl. Oct. 10, 1955. 7p. \$0.15(OTS).

3399 BNL-2390

Brookhaven National Lab., Upton, N. Y.

PRELIMINARY COMPUTATIONS ON THE "TEITEL" DESIGN BREEDER REACTOR. J. Fleck. Mar. 9, 1953. Decl. Nov. 9, 1955. 12p. Contract AT-30-2-Gen-16. \$0.15(OTS).

Preliminary calculations are presented for a bare poison-free breeder reactor of the Teitel design. The pile utilizes a graphite core containing U^{233} suspended in a liquid intermetallic compound of lead and tin. A coolant solution of Th^{232} and liquid Bi is circulated through the core, heat exchanger, and blanket area. Computations were made by assuming a value of the breeding gain and then determining pile specifications for a variety of values of the graphite-Bi ratio in the blanket. The maximum possible power removable was computed on a basis of flow rate of 10 ft/sec and a temperature rise of 300°C. (B.J.H.)

3400 BNL-2394

Brookhaven National Lab., Upton, N. Y.

TEMPERATURE COEFFICIENT OF THE LMFR. J. Fleck. July 13, 1954. Decl. Nov. 16, 1955. Contract AT-30-2-Gen-16. 3p. \$0.10(OTS).

Two temperature coefficients of reactivity have been calculated for the Liquid Metal Fuel Reactor. The prompt coefficient was computed disregarding temperature dependence of the graphite parameters. The final coefficient takes account of the dependence of the graphite parameters on temperature. Formulas used in the calculations are presented. The prompt coefficient was found to have a value of $-1.82 \times 10^{-4} \text{ deg}^{-1}$, and the delayed coefficient, $-1.96 \times 10^{-4} \text{ deg}^{-1}$. (M.P.G.)

3401 IDO-16118

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

A PROPOSAL FOR AN IN-PILE FILM BOILING EXPERIMENT IN THE MTR. C. F. Leyse. Aug. 10, 1953. Decl. Nov. 15, 1955. 26p. Contract AT(10-1)-205. \$0.25(OTS).

Consideration is given to what information is necessary in order to permit operation of the MTR in the film boiling region. Several types of experiments are discussed briefly and an in-pile film boiling experiment is proposed for the L-42 position of the MTR. (auth)

3402 N-985

Chicago. Univ. Metallurgical Lab.

PERIPHERAL PRODUCTION IN X PILE. J. Stephenson. Apr. 20, 1944. Decl. Nov. 23, 1955. 5p. (MUC-AMW-36). \$0.15(OTS).

It is proposed to fill the empty channels surrounding the active core of the X pile with thorium carbonate. Three rings of the carbonate would be put around the pile. The inner ring would be not less than 30 cm from the nearest uranium. The thorium would serve two purposes: the escaping neutrons would produce U^{233} in it and it would protect the concrete by decreasing the neutron flux. The estimated yield of U^{233} is 0.012 gm/1000-kw day and the thorium would absorb about 50% of the escaping neutrons. (auth)

3403 WAPD-134

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

MEASUREMENTS OF THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, AND FAST FISSION FACTOR OF WATER MODERATED SLIGHTLY ENRICHED URANIUM LATTICES. A. Z. Kranz. Sept. 1955. Decl. Nov. 29, 1955. 114p. Contract AT-11-1-GEN-14. \$0.60.

Reactor parameters have been measured for clean critical lattices of Al clad slightly enriched U rods and H_2O moderator. The rods were 0.600 in. diameter, 48 in. long, and enriched to 1.3% in U^{235} . The H_2O to U ratios used were 3:1, 2:1, and 1.5:1. The parameters measured were thermal utilization (f), resonance escape probability (p), and fast fission factor (e). Theory, methods, results, and difficulties are discussed. (auth)

Refer also to abstracts 3377 and 3404.

RADIATION ABSORPTION AND SCATTERING**3404 KAPL-919**

Knolls Atomic Power Lab., Schenectady, N. Y.

CALCULATION OF THE BREMSSTRAHLUNG FROM $Li-8$ ELECTRONS. L. H. Weinberg and H. E. Stone. June 15, 1953. Decl. Nov. 22, 1955. 48p. Contract W-31-109-Eng-52. \$0.25(OTS).

Two relatively straightforward methods of determining

the gamma (bremsstrahlung) flux and spectrum produced when beta-decay electrons enter a metal absorber are described. The methods are valid when the atomic number of the beta emitter is small so that few gammas are produced until the electrons escape from the emitter and enter the absorber. The specific case of Li^8 electrons absorbed in an iron container is calculated by both methods with good agreement. The case of a Fermi spectrum of Li^8 electrons entering a molybdenum absorber is also calculated and is shown to agree with published results. (auth)

RADIATION EFFECTS

3405 NAA-SR-1152

North American Aviation, Inc., Downey, Calif.

RADIATION EFFECTS QUARTERLY PROGRESS REPORT

FOR JULY-SEPTEMBER 1954. Frank E. Faris, ed.

Mar. 15, 1955. Decl. Nov. 9, 1955. 33p. Contract AT-11-1-GEN-8. \$0.25(OTS).

The theory of diamagnetic susceptibility in graphite has been re-examined to determine the cause of the discrepancy between room and liquid N temperature correlations of Fermi-level depression and exposure time in neutron-irradiated graphite samples. It was found that the size of the discrepancy could be reduced by using a value of 0.5 ev instead of 0.1 ev for γ' , the resonance integral between nearest neighbors in adjacent planes. The magnetic susceptibilities of several samples of graphite irradiated in the MTR have been determined. With larger amounts of damage, the amount of paramagnetism produced appeared to approach a saturation value rapidly. The thermal conductivity, electrical resistivity, and thermoelectric power of cyclotron-irradiated graphite have been measured. Graphs of the temperature dependence and exposure dependence of the three properties are given. Energy bond structure calculations have been set up for the cubic structures of metallic Th, U, and Pu. Iodide-processed Th was bombarded with electrons, and the effect on hardness was determined. The recovery of the induced hardness in-

crease appears to be nearly complete after the interstitials have migrated. Experiments were performed to find the approximate hardness recovery temperature of electron-irradiated Cu in the absence of recrystallization. It was concluded that the crystal defects responsible for the hardness increase disappear in the temperature range from 200 to 225°C. Electrical resistivity recovery in α -irradiated Au occurs at temperatures $\sim 20^\circ$ higher. Therefore, the same mechanism may not be responsible for both resistivity and hardness increase. Development of a high-temperature target box and a beam profile unit for the cyclotron are described. (M.P.G.)

SHIELDING

3406 BNL-1328

Brookhaven National Lab., Upton, N. Y.

LEAKAGE OF GAMMA RADIATION THROUGH SPHERICAL AND CYLINDRICAL VOIDS. William W. Pratt and Herbert J. Kouts. Aug. 25, 1952. Decl. Nov. 30, 1955. 77p. Contract AT-30-2-Gen-16. \$0.45(OTS).

Measurements were made in the BNL water tank shielding facility on γ leakage through spherical and cylindrical voids. Measurements are reported for no voids, for spherical voids having diameters 4, 6, 8, 12, and 18 in., and for cylindrical voids having diameters 2, 4, 6, 8, 12, and 18 in. (D.E.B.)

URANIUM AND URANIUM COMPOUNDS

3407 BMI-66

Battelle Memorial Inst., Columbus, Ohio.

GRAIN SIZE CHART OF URANIUM. H. A. Saller, R. F. Dickerson, and G. E. Lind. June 1, 1951. Decl. Nov. 30, 1955. 14p. Contract W-7405-eng-92.

A grain size chart containing photographs of typical U structures for grain diameters of 0.009 to 0.118 mm was prepared. All structures were photographed using both polarized light and bright field illumination. (J.E.D.)

NOTICE

It has been necessary to omit the Author Index and Numerical Index of Reports usually included in this issue. Cumulated indexes for Vol. 10, Nos. 1-12A, will appear in No. 12B, dated June 30, 1956.

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PUBLICATIONS RELATING TO BIBLIOGRAPHIC CONTROL OF USAEC RESEARCH AND DEVELOPMENT LITERATURE

The following publications prepared by the Technical Information Service Extension may be of assistance to librarians and users of AEC report literature. Individuals desiring copies of the publications should note the "availability" information after each item.

TID-4000

Cumulated Numerical List of Available Unclassified U. S. Atomic Energy Commission Reports. February, 1955. 204p. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C. \$1.00.

TID-4550 (Rev. 2)

Availability of USAEC Research and Development Reports. September, 1954. 22p. Available gratis from Technical Information Extension, Oak Ridge, Tennessee.

TID-5001 (1st Rev.)

Subject Headings Used in the Catalogs of the United States Atomic Energy Commission. First Revised Edition. Donald D. Davis, ed. March, 1955. 368p. Available from Office of Technical Services, Dept. of Commerce, Washington 25, D. C. \$2.10.

TID-5059 (2nd Rev.)

Corporate Author Entries Used by the Technical Information Service in Cataloging Reports. (Second Revised Edition). Charlotte F. Chesnut, Alden G. Greene, and Emil Schafer, comps. March, 1955. 234p. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C. \$1.25.

Guide to AEC Reports for the Depository Libraries. USAEC 1954. Available gratis from Technical Information Extension, Oak Ridge, Tennessee.

A Business Man Asks; How Can I Keep Up With Atomic Energy Development?

USAEC, Washington 25, D. C. Revised September, 1955. Available gratis from Industrial Information Branch, Division of Information Services, Atomic Energy Commission, Washington 25, D. C.

What's Available in the Unclassified Atomic Energy Literature—And Where You Find It. 1955. Available gratis from Industrial Information Branch, Division of Information Services, Atomic Energy Commission, Washington 25, D. C.